

DUST CONTROL ISSUE

GRAIN

ELEVATOR OPERATION AND MAINTENANCE

JANUARY 1940

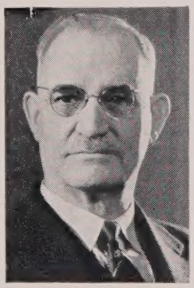
Grain Storage Policy Becomes

A Threat to Employment

In Terminal Grain Elevators

By T. C. MANNING
National President
Society of Grain Elevator Superintendents

TERMINAL elevator men are considering with much concern the effects of policies of the United States Department of Agriculture which tend to limit the amount of business done by these elevators and, therefore, to curtail employment in those plants. The most recent development of this kind occurs in connection with the government's corn program, which resulted in the purchase of a large quantity of small tanks for storage purposes.



Shortly before the harvest of the 1939 corn crop it became apparent that storage facilities for corn on the farms would be fully required to carry the corn to be sealed under the 1939-1940 loan plan and that consideration must be given to the disposition of the corn remaining under seal from the previous crop. The government announced a plan for resealing the old grain and relieved the farm storage situation by provision for shelling the old corn and storing it elsewhere. The amount of that corn acquired by the government, or resealed for farmers, was substantially greater than the capacity of country elevators to contain, and in September, 1939, terminal grain elevator operators as a group notified the Secretary of Agriculture that they were prepared to accommodate 130,000,000 bushels of corn in markets where the grain would not be out of position.

These operators offered attractive storage rates to the government, approximating only half of the normal storage rates, and in order to assure ample room for the use of the government, in many instances, disposed of wheat stocks that they might otherwise have carried and refused business that otherwise would have been accepted for their plants. Notwithstanding these efforts on the part of the trade, the Secretary of Agriculture decided not to make use of this available and convenient storage but arranged for the purchase of small steel tanks amounting in the aggregate to some 85,000,000 bushels of storage room and placed these tanks at country loading stations throughout the corn belt. The government's corn to the amount of some 75,000,000 bushels was placed in these tanks, and the terminal elevators thereby were deprived of this volume of business.

Corn Requires Care

THE safe storage of corn requires constant, expert supervision; drying, cooling, and cleaning equipment; and the mechanical apparatus for turning large quantities quickly. These requirements are found in terminal grain elevators, but there is no provision for such care of the grain in small tanks. The government, therefore, has assumed a serious risk in connection with the condition of the corn rather than to allow terminal grain operators an opportunity to assure the keeping of qualities of the grain.

This government policy has obviously resulted in a severe diminution of business in the terminal grain elevators throughout the grain belt; and with loss of earnings from storage, the operators have been obliged to reduce the working forces of the elevators. In some instances the houses are practically idle and otherwise they are working under a greatly reduced schedule. If this grain had been allowed to move naturally into the terminal elevators there would have been a greater need for employment of men to handle the grain and keep it in condition.

Terminal elevator operators are not only concerned over the loss of the corn business resulting from the government's refusal to store that grain in terminal elevators but are now looking with some uneasiness to a possible extension of the steel tank plan in the wheat areas. If this occurs there will be little left for these elevators to handle, and many of them must shut down entirely and others work with mere skeleton forces.

What Can Be Done?

All who are interested in the operation of terminal grain elevators, or in the employment of men in these elevators, should give serious consideration to the trend of governmental policies which affect these plants and should assist in bringing to the attention of the authorities the fact that there are abundant elevator facilities existing for the storage of all grain that may require storage; that these houses are operated economically and efficiently and offer greatly reduced storage rates to the governmental agencies; that they are equipped to care for grain and prevent loss from deterioration; that building steel tank storage is uneconomic in that it is unnecessary and represents a duplication of existing facilities; that tank storage is not safe for the proper handling and caring for grain; and finally, that the employment of men in terminal houses will be seriously affected by the continuance of the steel-tank plan.

With a firm conviction that injustice is being done the Terminal Elevator Operators and employees, I am appealing to the Elevator Superintendents to interest themselves and the employees personally, to put forth every effort to get this matter before their congressmen and the people in authority.

Editorial

GRAB YOUR PENCIL!

By Gilbert P. Lane, First Vice President, SGES; General Superintendent, Arcady Farms Milling Company, Chicago



A CONVENTION is old stuff? Sure it is! So is an organized democracy—referred to by some as "mob rule." Democracy of a type was practised 'way back in the days of Golden Greece, 'way back when the world was still flat and the most ingenuous device for destroying the home of an enemy was the catapult. Yet strangely enough democracy occupies the attention and energies of the majority of mankind today in the greatest display of organization that the world has ever witnessed. It is as old as Anno Domini and yet as fresh as tomorrow's bulletins in spite of its hoary age.

A convention, like a democracy, is a simeon pure example of skilled organization, and today's convention, like today's democracy, is as new as the next breath we draw.

The eleventh annual convention of the Society of Grain Elevator Superintendents, to be held in Toronto, March 31st to April 3rd, offers today's challenge to today's grain plant heads. It offers program organization in the highest sense to grain plant executives, and, through this organization, assured by the co-operation of every alert Superintendent, it opens the 1940 offensive for a greater grain handling business.

The Toronto convention will feature a program replete with prominent speakers who will bring the industry's problems out into the open and submit their ideas of solution. Constructive development of latent possibilities in the grain plant business will be initiated. Fraternity of grain plant men will be stressed. Organization of all resources, brains, intelligence, co-operation and confidence will be the keyword. As program chairman, please write to me and suggest your idea. Cast your vote. To assure the success of a convention, just the same as a democracy, every member of the industry must be actively and vitally interested.

GRAIN, Board of Trade, 141 W. Jackson Boulevard, Chicago, Ill. Telephone Wabash 3111. A forum for operative and mechanical problems in terminal elevators. Published monthly on the tenth, $1.00 per year. DEAN M. CLARK, Publisher; JOE MOSEY, Editor; WERNER HAUPTLI, 56 W. 45th Street, New York, Murray Hill 2-8763.

Front Page News

From Two Houston Papers

NEWSPAPERS have a way of using spectacular words that often do not seem justified by the circumstances which they describe. In both The Houston Press and The Houston Chronicle of December 19, 1939, the word miraculous is used to describe the escape of elevator employes trapped on the top floors by means of a POTTER Fire Chute.

Miraculous is hardly the proper word. The escape was not miraculous. It was calm, deliberate and entirely premeditated. It had been carefully planned with all the exactitude that modern science can afford. It had been assured far in advance of actual necessity. Nothing had been left to chance.

Every day more than half a million people depend upon POTTER Fire Chutes in just such emergencies. It was not miraculous for these men to escape through one. It would have been miraculous for them to escape without one.

Potter Manuf

6120 North California Avenue

The Houston Press

THE WEATHER: Cloudy to partly cloudy, cooler today.

IN TWO SECTIONS—SECTION 1 HOUSTON, TEXAS, TUESDAY, DECEMBER 19, 1939



y Landing" grins T. C. Bigley, employe of the public grain as he demonstrates how he slid to safety down the spiral ape yesterday, when an explosion tore through the elevator y while he was working in the upper floors of the structure.

* * *

Elevator Workmen Slide to Safety



Twelve workmen miraculously escaped death and injury yesterday when a dust explosion wrecked the upper floors of the public grain elevator on the Chip Channel. Pointing to where he was working at the time of the blast, and from where he slid to safety in the outside spiral fire escape is J. C. Wooley. He was slightly burned on the face, the only one of the 12 to receive anything other than superficial cuts and bruises. Beside him are George Merritt and A. D. Duke, also in the elevator when the blast occurred.

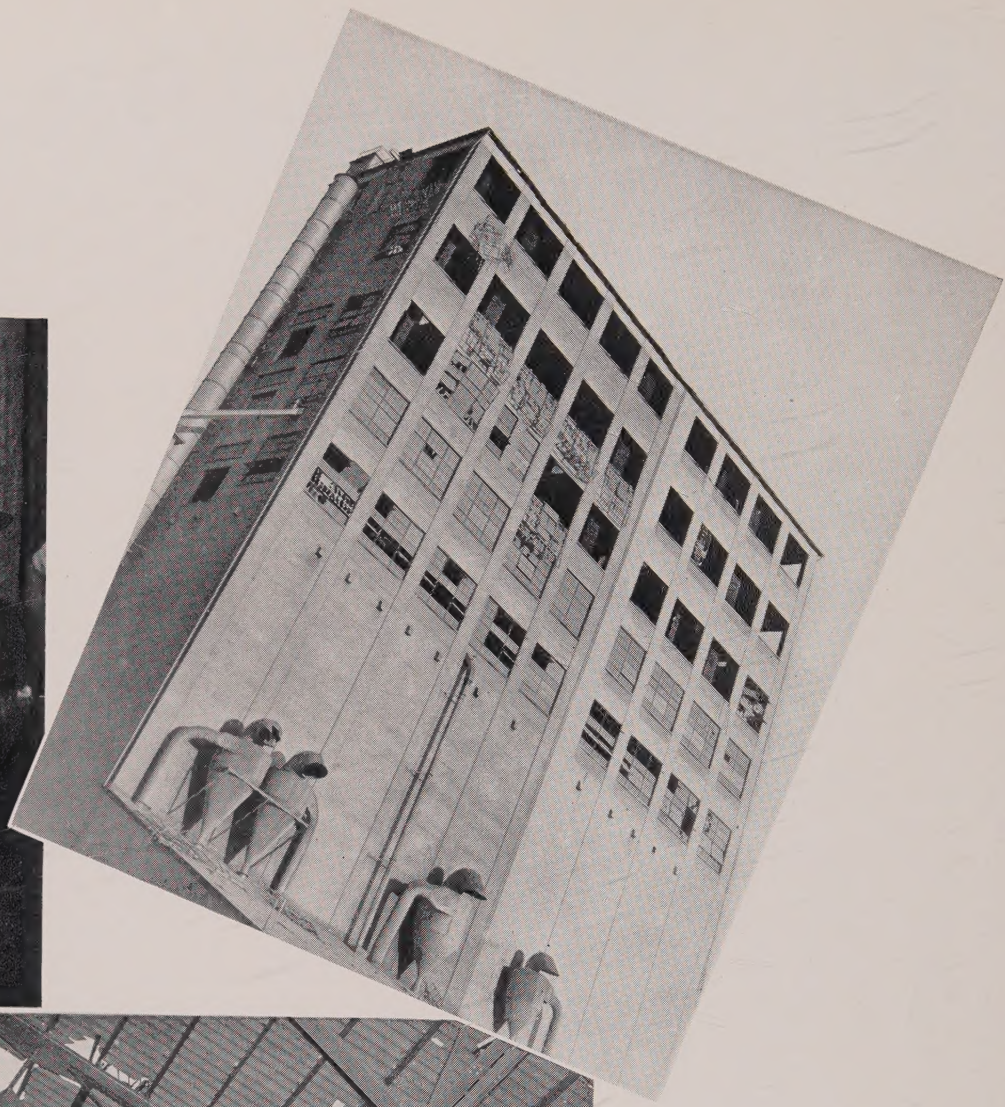
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Chicago, Illinois







Employes of the Houston Public Elevator narrowly escaped when an explosion rocked through the upper floors of the structure on December 18th. Top right is a picture of the elevator showing the broken panes and twisted casements which relieved the pressure of the blast. At the left is a section of the spiral fire chute down which employes slid to safety. G. H. Raezer, assistant foreman of the elevator, is examining one of the windows in the photo at top left. Below is a section of a light metal roof in the unloading shed. (Photos courtesy of the Houston Chronicle and the Houston Press.)

Houston, Texas, and St. Joseph, Mo., Have

Three Dust Explosions

To Mar Our Record for Last Quarter

TWO explosions at Houston, Texas, marred the last quarter record of the year just ended; and a serious explosion at St. Joseph, Missouri, headed the list for 1940. On November 11th the explosion at the elevator of the Houston Milling Company did serious damage to the plant and injured one employee; while on December 18th an explosion at the Houston Public Elevator blew out windows and casings of four upper floors. Damage was estimated at $50,000 and one employee was slightly injured.

On January 3rd, the St. Joseph explosion damaged the Union Terminal Railroad Elevator to the extent of $20,000 when it wrecked part of the cupola over the storage bins, damaged several bins, the floor and the tripper directly above the bins. No one was injured and damage to the grain was slight.

The walls of the cupola in which the St. Joseph explosion occurred were formed largely by glass which easily gave way before the pressure of the explosion. Careful investigation failed to reveal any evidence of explosive force except in the vicinity of the tripper where grain was being diverted from the belt to the bins. It is assumed that either a static charge or a spark caused by some foreign matter in the grain was responsible for the ignition of the cloud.

The elevator, operated by the Hart-Bartlett-Sturtevant Company, is of two and one-half million bushel capacity. Its 69 reinforced concrete bins are arranged in three rows, with two rows of interstice bins. Each bin is 91 feet in height and 22 feet in diameter.

Eye-Witness Story of Blast

SEVERAL of the nine legs were transferring grain when three separate explosions blew through the upper floors of the workhouse at the Houston Public Eelevator. Of the 12 employees in the building at the time, six were working on the upper floors. One of these described his escape as follows:

"I was working on the fifth floor as we were transferring grain from one bin to another," he said, "when I was lifted off my feet by the force of the explosion. I heard the noise of the blast after I felt the concussion of the air.

"Then I saw the flames that followed. They didn't seem to come through the air, but instead they leaped and darted across the floor apparently about ankle high. I was frightened, I don't mind admitting. I'd heard of what happened in dust explosions—and I figured this was one of them.

"I didn't wait to see what was going to happen, but made a dash for the fire chute, jumped in and slid to safety." The Houston Public Elevator is equipped with a spiral type fire chute that extends to the top floor.

Water Damages Grain

APPARENTLY the first explosion occurred on the top floor of the structure for it was here that the steel window casings were twisted and torn into bits. From the top floor the explosions spread to the floors below, knocking out the windows and the steel casings and damaging the inside of the building. The tall bins of concrete which stretch back of the elevator proper and to which grain is carried on endless belts for storage were not damaged by the blasts, but some 50,000 bushels of grain were ruined by the water and chemicals used to extinguish the fire which followed the explosions.

The elevator was erected originally in 1926 with a million-bushel capacity. Later this was increased to three and one-half million. It was erected and is operated by the Port Commission for the Navigation district. Preliminary checks by engineers showed that the walls and all supporting structures were in good condition, undamaged by the force of the blasts.

★

CHECKING AIR PIPES IN ELEVATOR

AN ORDINARY spark plug tester is being used to check dust pipes for static charges by Harold Wilber of A. E. Staley Mfg. Company, Decatur, Ill. Mr. Wilber carries the tester in his pocket, and he has frequently found static charges sufficient to register on this tester.

In each case, however, it was found that the pipe where this static charge was built up had been put together with roofing cement at the joints which insulated the section of piping from the natural ground provided by the support of the pipes into the elevator structure.

This proves, says our informant, the desirability of reliable mechanical installation of piping systems, as the better class jobs are never put together with roofing cement but are riveted and soldered and supported by metal straps or hangers into the structure which actually grounds the system.

This certainly sounds like a splendid "tip" to be passed on to others, and we hope Mr. Wilber will give us more details for publication.



Graphic details of the Houston explosion show the unbelievable force of a dust explosion. Top left is a view of the roof of the unloading shed. Top right is a hole, 18 feet in diameter, blown through the floor of the third story. Bottom, F. W. Cloud, port commission employe, looks over debris and wrecked machinery on the top floor of the elevator. (Photos courtesy of the Houston Chronicle and the Houston Press.)

DUST EXPLOSION PREVENTION
IN LARGER GRAIN PLANTS

By DAVID J. PRICE,* Principal Engineer in Charge
Chemical Engineering Research Division, Bureau of Agricultural Chemistry and Engineering
U. S. Department of Agriculture, Washington, D. C.

Introduction

THE Bureau of Agricultural Chemistry and Engineering, which I have the honor to represent at this meeting, is engaged in scientific research studies relating to chemical and engineering problems connected with explosions and fires in the handling, milling, processing, and storage of agricultural products. In this research work on explosion and fire prevention our Bureau has cooperated very closely with the agricultural industries directly concerned and with the fire departments in the handling of fire-fighting operations in connection with these industrial plants. A very pleasant and helpful relationship has been established with these industries, fire departments, and fire prevention associations, safety and insurance organizations and State and Federal agencies. Among the national organizations cooperating in this explosion and fire prevention work are the National Fire Protection Association, National Safety Council, International Association of Fire Chiefs, International Association of Fire Fighters, National Board of Fire Underwriters, National Fire Waste Council, Western Actuarial Bureau, American Standards Association, and a number of other national organizations interested in the fire and explosion prevention movement.

This direct contact with these organizations affords a ready means of translating into actual practical use the results of technical research on dust explosion prevention, and it is therefore especially pleasing to have an opportunity to present some of the developments in this research work to representatives of the grain-handling industries.

Research Work on Dust Explosion Prevention

THE Federal Government has conducted extensive research studies to determine the causes of dust explosions and to develop methods for their prevention and control.

The Bureau of Mines, U. S. Department of the Interior, has definitely established the fact that explosions can occur in bituminous coal mines without the presence of explosive mine gases, and that the ignition of the coal dust itself has been responsible for many disastrous mine explosions. As a direct result of effective research work by that Bureau methods have been developed for the use of inert dusts, such as shale, limestone, and gypsum, for the control and prevention of coal dust explosions. Reports issued by the Safety Section of the Bureau of Mines indicate that these methods have proved very satisfactory.

The studies of the Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, show that under favorable conditions a dust explosion can occur in any industrial plant or manufacturing establishment where combustible dust is created during manufacturing operations. When these research studies were undertaken it was generally supposed that it would be necessary to grind or crush grain and produce the powdery starchy material from the inside of the grain before an explosive dust would be encountered. This was largely due to the fact that an explosion of flour dust produced in the manufacture of wheat flour in a Minneapolis mill in 1878 caused the loss of 18 lives and extensive property damage. A large number of explosions in grain elevators, where no grinding or manufacturing operations were engaged in, showed definitely that the dust produced in the handling, elevating, conveying, and storing of grain also was explosive.

A survey has shown that the dust explosion hazard exists in a wide range of industries, such as flour and feed mills, grain elevators (both terminal and rural), starch factories, sugar refineries, woodworking plants, powdered milk plants, soap powder factories, sulphur crushing and pulverizing, hard rubber recovery plants, cork pulverizing plants, chocolate and cocoa plants, paper mills, insecticide plants, celluloid and textile plants, aluminum, zinc, and magnesium plants, fertilizer plants, and rosin-handling plants.

We find, therefore, that approximately 28,000 industrial plants in the United States are subject to the dust explosion hazard. These plants normally employ 1,325,000 persons and manufacture products having an annual value of more than ten billions of dollars.

Theory and Nature of Dust Explosions

FROM the research work on this problem, it is now generally accepted that in theory a dust explosion is somewhat similar to a gas explosion. The dusts require definite ignition temperatures and also have what may be termed the lower and upper limits of concentration for explosion. For example, methane gas (mine gas), CH_4, to be explosive, requires a mixture of 5.5 per cent gas and 94.5 per cent air, which we term the lower explosive limit. When the mixture contains approximately 10 per cent of this gas and 90 per cent of air, the explosion is most violent. When the gas is increased to about 15 per cent with 85 per cent of air, the mixture becomes non-explosive and cannot be ignited. This is termed the higher limit of explosive concentration. These limits of concentration vary with different dusts as well as with different gases.

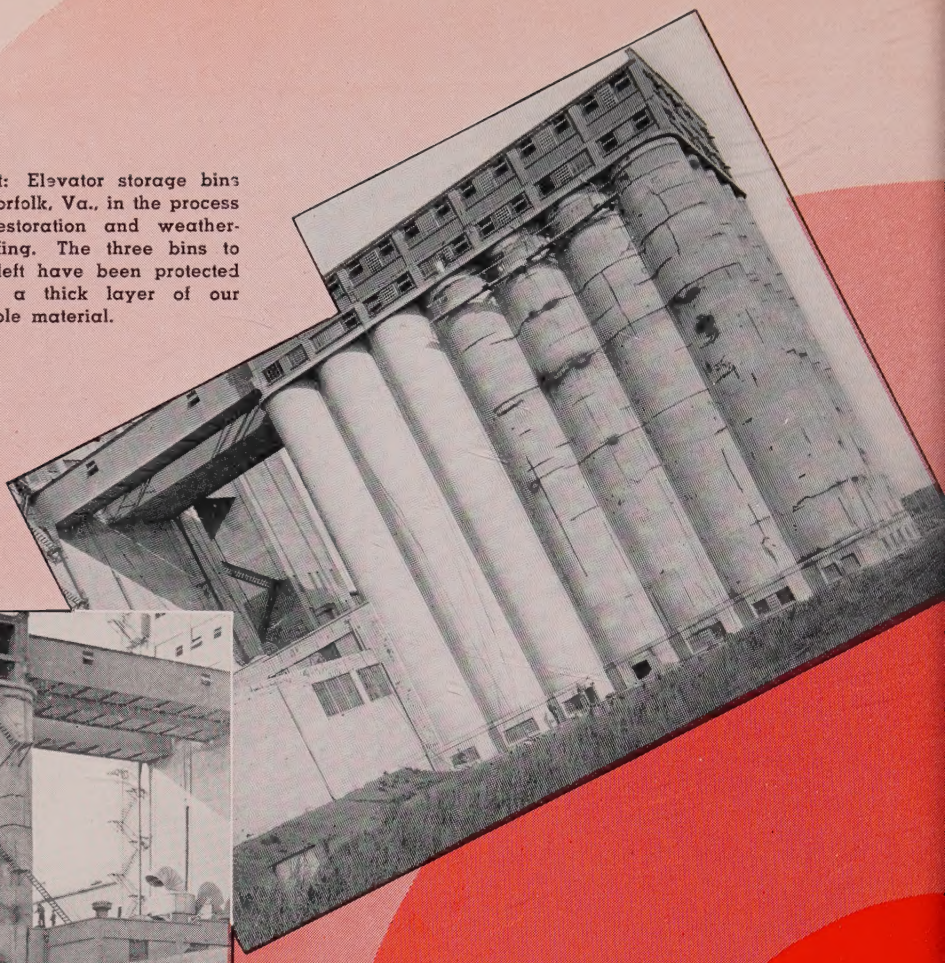
The ignition sources of explosive dusts are practically identical with those of explosive gases so that any source which will ignite explosive gases will ignite explosive dust clouds. These sources of ignition include matches, open flames, electric sparks and fires.

One of the principal factors in the explosibility of dust appears to be the degree of fineness of the dust. The explosion appears to result from the propagation of flame through a finely and uniformly divided dust cloud. This flame travels at a rapid speed, building up considerable pressure and

(*Continued on Page* 14)

**Before the monthly meeting of Chicago Chapter, Society of Grain Elevator Superintendents, Board of Trade Building, Chicago, December 6.*

Right: Elevator storage bins at Norfolk, Va., in the process of restoration and weather-proofing. The three bins to the left have been protected with a thick layer of our flexible material.





The opposite side of the elevator in the top picture before work was begun. Below: The long loading wharf with the Norfolk & Western elevator in the background.



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Left: A loading wharf just perfectly reconditioned by our exclusive IN-FIL-TRO system.





Above: A close-up of the side of the structure in process of weather-proofing. Below: Men working on the wharf with pneumatic drills, cleaning the pits and cavities to provide anchorage for the patches.

Pays!

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RISE OF 11.9% PREDICTED IN GRAIN CARLOADINGS

AN ESTIMATE of 222,114 cars will be required to move grain during the first quarter of 1940 as compared to a total of 198,165 used in the first quarter of 1939. This increase of 11.9% was reported by the 13 Shippers' Advisory Boards.

In addition to the increase for grain,—flour, meal and other mill products will require another 200,555 cars, and increase over 1939 of 5.7%.

Predictions are from other sources that grain movements will top even these figures. The Commodity Credit Corporation has just announced that farmers having wheat from 1938 under loan will be required to pay their obligations or surrender the grain by March 31st. In addition, loans on all 1939 wheat mature April 30th and the corporation does not now contemplate extending that date. In view of these conditions, it is certain that large movements of grain will take place during the first quarter of this year.

Carloading figures for the past year were:

Commodity	1939 Actual	1940 Estimate	Pct.
Grain	198,165	222,114	11.9
Flour, Meal, Mill Products	189,801	200,555	5.7
Live Stock	141,233	143,995	2.0
Coal and Coke..	1,726,870	1,889,244	9.4
Forest Products	346,968	381,091	9.8
Ore	95,222	134,039	40.8

★

Hudson Bay May Become Canada's Sea Gate

A TIMELY report by Dr. Alexander D. Bajkov, a Russian scientist at Churchill, Manitoba, on Hudson Bay, may serve to popularize the bay route for export shipping. If the war is of long duration, Dr. Bajkov is convinced that grain men will find the bay route the safest route by which to ship to Europe.

The report by Dr. Bajkov states that only one–half to three miles of ice at the mouth of Churchill harbor would have to be kept open to facilitate continuous shipping through the northern passage during the winter months.

"Hudson Bay and Hudson Strait never freeze in winter," the report continues. "The ice from Fox channel, considered the chief menace to the extension of the Hudson Bay route is not a determining factor. The local ice condition at Churchill determines the closing date. The open water during the coldest part of the winter is only one–half to three miles from Churchill, and I can see the possibilities for navigation for nearly all the year."

HYBRID CORN GAINS IN FAVOR

MORE than 43% of the corn acreage of the past year was planted to hybrids as against 31% for the year preceding. The proportion of total acreage planted to these varieties varies from three-fourths in Iowa, two-thirds in Illinois, three-fifths in Ohio and Indiana and one-half in Minnesota and Wisconsin to about 5% in North Dakota and Kentucky.

This development and rapid adoption of hybrid seed corn has been perhaps the most important production technique adopted in recent years. First used by a few commercial growers in Illinois and Iowa between 1923 and 1936, hybrid corn is now produced commercially in all corn states.

Significance of this widening use of hybrid seed lies in the higher production per acre with the prospect that by 1945 or 1946 the United States crop will probably be increased by 300 million bushels, or 20%. Unless new outlets for corn and corn products develop, it does not seem probable that the markets can absorb the increased supply of corn which the present acreage is capable of producing when hybrid seed is used throughout. The alternative will probably be to turn existing corn land to other uses, thus diminishing the number of acres planted to corn.

★

CONDITIONS FAIR IN THE NORTHWEST

RECEIPTS of grain at the terminal elevators of the Northwest has been in fair volume. Some loans are being paid off on wheat but not to such an extent as to have any great effect on the movements. Such is the information contained in a letter from L. C. Webster, Secretary of the Northwest Country Elevator Association. Sixty million bushels of wheat are held on loans and probably all of this will be moved before April 30th. About eight million bushels of this represents farm-stored wheat. The percentages of last year's crop remaining on the farm are:

	Per Cent
Minnesota	59
Montana	46
North Dakota	50
South Dakota	65

Precipitation for the year just ended was below normal. The weather bureau figures for precipitation during 1939 are: Minnesota, 87% of normal; Montana, 85%; North Dakota, 82%; South Dakota, 79%.

RUBBER PAINT VS. STATIC

WOULD painting dust collection systems with a rubber paint—both inside and outside the piping—be inclined to eliminate the hazard of static sparks being generated and liberated? And how about on other static developing equipment?—Super Anxious.

Answer: Sounds reasonable that the static charge generated in a dust collection system could be enveloped with a solid coating of rubber paint—provided, of course, there were no exposed surfaces overlooked in the painting. Today, dust collection systems are grounded at frequent intervals, so that the protection of a rubber paint should certainly minimize, if not eliminate this hazard.

As to coating other equipment known to generate static the approved method heretofore has been to use aluminum paint to diffuse static charges to some ground. While the rubber paint might aid materially, yet it is doubtful that such equipment as a cleaner could be sufficiently encased in rubber paint to be entirely effective.

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STATIC IN DUST SYSTEMS

STATIC electricity in dust collection systems will ignite gas, according to Hylton R. Brown, of the U.S.D.A. Some dust cloulds take on a positive charge of electricity while others assume a negative charge. The equalization of these charges may cause a spark of sufficient intensity to ignite the gas.

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FIGURES RELEASED BY CCC

FIGURES released this month by the Commodity Credit Corporation show a total of 354 million bushels of grain held as collateral against outstanding loans. The figures are for December 31, 1939.

They are:

Corn:	Bushels
1938	4,983,741
1938-39	186,302,812
1939-40	153,074
Total	191,439,627

Wheat:	Bushels
1938	3,649,008
1939	157,396,535
Total	161,045,543
Rye Loans.....	1,433,394

"THE FALL GUY" MAY APPEAR AT KANSAS CITY MILL

EVIDENTLY the "Fall Guy" made quite a hit, judging from numerous references to his appearing on the program the Kansas City Chapter of the Supers' Society put on in November. The latest invite comes from F. B. Fitzmorris, of Washburn-Crosby Company, who says:

"A number of the men from our plant saw this picture, and at our last Safety Meeting they suggested we try and get it for showing at our mill. In contacting Mr. Manning of Kansas City Chapter of Elevator Superintendents, he suggested we get in touch with you for particulars, such as date and if anyone can operate, also what are the charges, etc."

We're always glad to pass a good thing along.

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Gladly, Mr. Kellett

IN TWO of the issues of "GRAIN" in the summer of 1939, you published an article by Dr. J. G. Dickson of the University of Wisconsin on barley for malting purposes, a subject in which I am keenly interested.

Would you be kind enough to have this article looked up for me and send me a copy of each edition in which it appeared?—M. G. Kellett, Superintendent, Great Western Malting Co., Vancouver, Washington.

★

EASTERN HOUSES GOING FULL TILT

THE soy bean situation, writes Frank A. Peterson, Superintendent at the Norris Grain Company's elevator at Baltimore, Maryland, has the houses here going full tilt every day and part of the night, too. The men on the job are "busier than a cat on a tin roof."

Interesting notes in his recent letter include the following: "Today the wheat stock is close to six million. There are big stocks of corn and beans, too. I heard yesterday that the houses in Philadelphia were full and refusing grain until ships are available to relieve them. The same situation will happen here in a week, I think.

"If the crowds on the street mean anything, the stores are doing a land office business. The 'little woman' says the stores are really selling plenty. This may be a great big 'hick' town compared with up and coming cities of the Middle West (what was done twenty years ago is still good enough to do today, they figure) but just the same, we like it."

Damaged Corn Ordered Sold by CCC

COMMODITY Credit Corporation has ordered that two carloads of old shelled corn stored in an Illinois elevator be shipped out because of damage from insects, it was reported recently. Eight elevators have reported lesser damage to the top surface of the corn stored in their bins. In all cases the orders from the CCC have been to skim off the top and turn the balance of the corn.

Many reports have been received that corn stored in bins under the CCC plan is heating at the top. The corn evidently was stored at high temperatures and as soon as the outside temperature dropped moisture condensed in the cold upper levels, it is thought. Some bins are said to be crusted with a top layer and at least one station reports sprouting.

Storage operators have been advised to watch their bins for weevil, angoumois moth and other infestation.

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Welcome Congratulations

WISH you continuous success in the wonderful work that you are doing, and pleasant memories of meeting you at the Fort William–Port Arthur convention.—E. Powell Hamlin, The Strong-Scott Mfg. Company, Ltd., Winnipeg.

DINNER DANCE AT MINNEAPOLIS

THE Minneapolis Chapter of SOGES will hold a dinner-dance on the evening of February 3rd. Special attractions are being planned to put the date down in history.

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Kansas City Meets

SEVENTY-NINE members attended the joint meeting of the SOGES and the Operators in Kansas City last December 12. The operators promised to return the compliment some time in February, reported Chapter Secretary Claude L. Darbe.

T. C. Manning, National President of SOGES, was introduced by Chapter President W. H. Kamp who also introduced H. R. Clark. J. W. Buffington, Warehouse Commissioner of Missouri, dealt with the methods of obtaining needed legislation for the needs of the grain industry.

O. T. Cook, of the Standard Milling Company, entertained with a humorous talk; and Dr. E. G. Beyfield, in charge of milling at Kansas State College spoke briefly on the milling qualities of various wheats. John Parker, head of the Kansas Wheat Improvement Association, explained Kansas varieties and their good and bad points.

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(*Continued from Page 9*)

thereby producing what we ordinarily call the explosion. It has therefore been extremely difficult in certain instances to determine definitely when the fire ended and the explosion started. It would appear that any fire might result in an explosion if combustible dust clouds are present.

The ignition of an explosive mixture of dust and air results in a primary flash or explosion of limited proportions. The concussion accompanying this primary ignition, however, is sufficient to shake into suspension the dust that has settled, lodged, or accumulated on ledges, beams, girders, machinery parts, and inaccessible points in the plant. The dust forced into suspension in the air in this manner feeds the flame or fire from the first or primary explosion and causes a secondary explosion of larger proportions in which higher pressures are developed and considerable violence results. (From a sack of flour weighing 98 pounds and a room containing 4,000 cubic feet of air, enough force could be generated to throw a weight of 2,500 tons 100 feet high.)

The importance of removing the settled or "static" dust in an industrial plant is therefore a vital factor in dust explosion control and prevention. If there is not sufficient dust to permit the primary flash to propagate, the flame gradually dies down, and there is no secondary explosion.

The two principal factors in dust explosion prevention in industrial plants are:

(1) Effective measures for control and removal of explosive dust.

(2) Elimination and control of sources of ignition.

Methods for Prevention and Control of Dust Explosions

1. Dust Collection and Removal—Cleanliness and good housekeeping are of prime importance in dust explosion prevention. It is impossible to handle or clean grain without making dust, but the dust should be collected and removed without being permitted to accumulate in any section of the plant. *A dust explosion cannot occur unless combustible dust is present.*

2. Removal of Foreign Material from Grain—Foreign material in the grain has been responsible for several explosions in grain elevators. Investigation of these explosions indicated that the dust clouds had been ignited by sparks from metal particles in the grain. Methods must be developed, therefore, for the effective removal of any metal or other foreign material that may drop into the grain while it is being handled. It is difficult in many instances to prevent foreign material from entering equipment in grain-handling operations, but screens of 1½ to 2-inch mesh placed in the gratings over receiving pits have in many instances stopped large pieces of metal from entering the pits with the grain. *The use of such screens and the practical value of magnetic separators in the grain-handling sections of the plant should be given further attention.*

3. Inert Gas Protection in Grinding and Pulverizing Operations—The reduction of the oxygen content of the air in the enclosed system by the introduction of inert gas, such as carbon dioxide (CO_2), in grinding and pulverizing operations has proved effective in the control and prevention of dust explosions. When the oxygen content is reduced to approximately 12 per cent in grain-grinding operations, complete protection is afforded. The reduced oxygen content (as the result of the addition of inert gas) prevents the ignition of the dust cloud in the grinding machine, and also prevents the spread of fire through the conveying and elevating machinery.

4. Protection of Electrical Appliances and Equipment—A study of the causes of dust explosions has shown the danger of inadequately protected electrical appliances and equipment. Electric lamps should be protected with outer dust-proof globes and heavy wire guards to prevent breakage. Portable spotlights of suitable design and construction to be directed into bins through manholes should be used as temporary or occasional lights for bin examination, instead of electric light globes on extension cords lowered into bins. This recommendation is covered in the Safety Code for Terminal Grain Elevators.

5. Control of Static Electricity—Static electricity must be recognized as one of the prominent causes of dust explosions, and considerable attention has been given to the development of control methods for this hazard. Provision should be made for the removal of static charges on all types of mechanical equipment handling combustible dusts or operating at points in the plant where these dusts are present.

6. Value of Closed Storage Bins—The value of closed bins and the undesirability of interconnections between storage bins are indicated by explosions in grain-handling plants. Open storage bins and bins with direct connections permit the rapid spread of flame over the tops of the bins and thereby extend the violence of the explosion. Preventing the spread of fire from one storage bin to another is of prime importance.

7. Explosion Venting Areas in Grain-Handling and Milling Plants—The Chemical Engineering Research Division of the Bureau of Agricultural Chemistry and Engineering has shown that it IS possible to vent grain dust explosions without structural damage, and the effectiveness of glass vents in actual explosions has confirmed the tests of the Bureau. In one case the workhouse in a large terminal grain elevator was saved from destruction by an adequate glass venting area. In another case proper venting area to relieve the pressure from an explosion in the workhouse of the elevator would have prevented the complete destruction of the top of the house. Provision for venting dust explosions should be made in the construction of all new grain handling plants. It is recommended that for satisfactory venting of dust explosions in grain elevators not less than 1.25 square feet of venting area be provided for each 100 cubic feet of space (1 square foot to 80 cubic feet).

Safety Codes for Dust Explosion Prevention

ONE of the principal accomplishments in dust explosion control and prevention is the development of safety codes by the Dust Explosion Hazards Committee of the National Fire Protection Association. This committee, composed of representatives from the various industries directly concerned and from insurance and safety organizations, State and Federal officials, and construction and equipment engineers, works under the leadership of the Chemical Engineering Research Division of the Bureau of Agricultural Chemistry and Engineering.

These safety codes, published by the Bureau of Labor Statistics of the U. S. Department of Labor as Bulletin No. 562 and supplement No. 617, both entitled, "Safety Codes for the Prevention of Dust Explosions," have been very helpful in the application of measures for the prevention of dust explosions and fires.

Progress in Dust Explosion Control

IT is very gratifying to observe that there has been a marked reduction in losses from dust explosions in recent years, particualrly in the food industries.

In the starch and corn products in-

dustries, where disastrous dust explosions have occurred, no life has been lost from a dust explosion since September 20, 1930, a period of over nine years. This remarkable record for the starch and corn products industries is a significant indication of the value of the work of the safety organizations in this industry. It shows progress in dust explosion control and prevention.

Losses also have been reduced in flour mills, where disastrous explosions were experienced in the earlier years of this important industry.

We can more fully appreciate the reduction of dust explosion losses in this group of food industries when we realize that during the same period a large number of dust explosions have occurred in other branches of the grain-milling industry, resulting in large losses of life and extensive property damage.

The sugar-refining industry also has established a remarkable record. Not a life has been lost in an explosion of sugar dust since June 13, 1917. Similar progress has been made in cocoa and chocolate plants and in the grinding of coffee and spices.

Comparison: Elevators Losses Ascending

ALTHOUGH losses from dust explosions have been reduced materially in the food-manufacturing industries which have cooperated in working out and adopting practical safety and preventive measures against dust explosions and resulting fires, there is still need for more definite attention to the application of methods for the control and prevention of dust explosions in grain elevators. Since 1930, 56 grain elevator explosions have been reported. In these explosions 40 people were killed, 145 were injured, and the property losses amounted to more than $7,500,000. These 56 explosions were almost 36 per cent of the total number of explosions reported during the period. This is a positive indication that more definite attention must be given to dust explosion prevention in grain elevators.

Effect of New Processes

ALTHOUGH considerable progress has been made in the United States and Canada in the control and prevention of dust explosions in grain-handling and milling operations, it must be admitted that all possible causes of dust explosions are not positively known. Dust explosions may occur in an industrial plant as a result of some newly developed type of mechanical or electrical equipment. Many of the dust explosions in recent years in the United States have been directly associated with the introduction of new manufacturing processes which have opened up additional sources of ignition and have resulted in conditions favorable to explosions. It is therefore highly desirable that new manufacturing operations be carefully examined to detect possible dust explosion hazards, and that attention be given to the adoption of preventive measures.

Conclusions and Recommendations

ALL the elevators involved in the Calumet explosion and fire on May 11, 1939, were of the old style wooden type, which made it impossible or impractical to comply with many of the suggestions in the terminal grain elevator safety codes. Unusual precautions had been taken for the prevention of fire, but this case demonstrated again that an elaborate sprinkler system can be rendered useless by an explosion. It is believed that it might have been possible to provide some protection in Elevators B and C if power could have been maintained at the fire pumps and control valves to cut out the damaged sections had been available. Where sprinkler systems are subject to the explosion hazard, it is suggested that underground power lines to the pumps be provided and that remote control valves be installed to cut damaged sections of sprinkler piping.

The increased use of motor trucks for the transportation of grain, and the hazards incident to their operation in dusty atmospheres, emphasize the need for further study of this problem. In some cases it is known that tilting of the truck to unload the grain may cause gasoline to spill from the tank of carburetor. After long runs with heavy loads the exhaust pipe and muffler of trucks may be hot enough to ignite dust. A backfire when the truck is started after unloading would be capable of igniting dust deposits around the dump. If this method of grain handling is used at an elevator, it is recommended that all possible precautions be taken to eliminate the sources of ignition mentioned.

The regulations which prohibit the application of suction before weighing grain entering an elevator prevent the elevator operator from providing adequate protection. Foreign material in grain received at an elevator is frequently of a type which may produce sparks if it enters the grain-handling machinery. Dust accumulated in the grain during previous handling operations must be received into the house with the grain and weighed. It is suggested that attention be given to the possibility of developing some system whereby dust removal during the handling of grain could be under supervision to prevent abuses. Dust could be caught in a bag and the bag included with the shipment where it is necessary to maintain weights. Some provision must be made to remove the incentive for elevator operators to return to the grain the dust removed during handling operations in order to maintain their incoming and outgoing weights. It will be necessary to develop and install effective methods for dust collection and dust control in grain elevators in order to reduce dust explosion losses in this industry. Until this is done it will not be possible to make progress in dust explosion control in terminal grain elevators comparable with what has been already accomplished in the control of the dust explosion hazard in other grain and milling industries.

Dust Control in Grain Elevators

IT MUST be recognized that the most disastrous losses from dust explosions are occurring in terminal grain elevators and that satisfactory progress has not been made in the control of dust explosions in this branch of the grain-handling industry. Much of this can be assigned to the lack of provision for adequate dust control during handling, storing and shipping operations.

In considering this matter several years ago when it was apparent that extensive losses were occurring, the Bureau of Chemistry in the Department of Agriculture learned that many of the dust-collecting systems installed in grain elevators throughout the United States could not be used, or were dismantled because of the objection of the officials having jurisdiction over the weighing of the grain. The weighing departments stated that grain weights were greatly affected by the action of suction used in the collection of the dust. Reports of tests conducted by a number of elevator operators, however, indicated that the weight of the dust removed is almost negligible. Some men experienced in grain handling stated that less dust is removed by suction than is lost in handling grain by means of poor machinery, with no dust collecting equipment.

Confronted with these conflicting statements, the Bureau of Chemistry made a preliminary study of the

effects of dust collection on the weight of grain. The results of this study showed that much depended on the design and installation of the dust collecting equipment. In many cases the equipment seemed to have been installed with no knowledge of the fundamentals of good design. In some cases the claims of weighing departments that grain had been drawn out by improper application of suction to remove the dust at certain points between the car which was being unloaded and the scales were probably correct. No information concerning a generally accepted method of applying suction or the proper equipment to use could be obtained. Every elevator seemed to have its own system of dust control and no standards existed. None of the systems were so installed as to permit inspection, nor were they so designed that it would be impossible to lift grain by increasing the speed of the fan, with a corresponding increase of suction.

The results of these preliminary investigations showed the necessity for a detailed study of the problems of controlling dust conditions in grain elevators. U. S. Department of Agriculture Bulletin No. 1373 entitled, "Dust Control in Grain Elevators," by Hylton R. Brown and J. O. Reed, published in February, 1926, and revised in March, 1928, contains the results of these investigations.

Methods of Dust Control

THE dust conditions in a grain elevator are effectively controlled only when:

(1) Dust clouds are eliminated at their point of origin by the application of suction.

(2) Dust accumulations are promptly removed from the building, either by a vacuum cleaning system or by a floor-sweep system.

(3) The elevator and equipment are well ventilated.

The mechanical methods of controlling dust conditions can be divided into: (1) dust collection; (2) dust removal; (3) ventilation.

(1) Dust collection deals with the methods of removing dust clouds at their source by means of induced air currents, supplied through specially designed hoods connected to a fan system.

(2) Dust removal deals with the methods of removing static dust, that is, dust which has settled and accumulated on the floors, walls, equipment, etc.

(3) Ventilation can be divided into natural ventilation and mechanical ventilation.

Dust Collection

DUST clouds rise at all points in the grain-handling system where grain is thrown, agitated or brought in contact with air currents. The principal points at which dust clouds are created in a grain elevator are: (1) at receiving or unloading pits; (2) at elevator boots; (3) in elevator heads and hoods; (4) at garners and scale hoppers; (5) at belt loaders; (6) at trippers; (7) at bins; (8) at discharges of conveyor belts; (9) at tails of conveyor belts; (10) miscellaneous points such as in marine towers in unloading boats, around turn heads or circle spouts on distributing floors or in basements and similar points of operation.

Dust Removal

DUST accumulations and deposits are removed from the floors, walls, ledges, and equipment of an elevator and conveyed to a central point of deposit outside the plant by a number of methods such as: (1) brush and broom method; (2) floor sweep systems; (3) compressed air; (4) vacuum cleaning systems.

Natural Ventilation

NATURAL ventilation can be accomplished by: (1) doors; (2) windows; (3) louvers; (4) stationary roof ventilators; (5) revolving roof ventilators; (6) pressure ventilators; (7) floor ventilators; (8) interstice bin ventilation of basement.

Mechanical Ventilation

MECHANICAL ventilation can be accomplished by: (1) disc ventilating fans; (2) interstice bin fans.

Dust Control Equipment

DUST control equipment in grain elevators includes: (1) fans; (2) piping system; (3) dust collectors; (4) grain traps; (5) suction regulators; (6) inspection traps; (7) air velocity control valves.

Effect of Suction on Grain Weights

OBSERVATIONS have been made by various agencies in grain elevators in various parts of the United States to determine what effect the use of suction as applied by dust collecting equipment may have on grain weights.

(1) Tests were conducted by the Bureau of Chemistry, U. S. Department of Agriculture, in an export elevator equipped with a dust collecting system that applied suction to the scale hoppers, garners, belt loaders, and boots. One of the scale hoppers was filled with No. 2 hard wheat and weighed. The grain was then dumped and spouted into a storage bin from which it was later transferred to a shipping belt to be elevated for reweighing. Four runs were made—two with suction and two without suction. The garner bin was swept clean before each weighing, and the first weight of each run was taken under the same conditions as the last weight of the preceding run. Four suction lines not connected at hoods acted directly on the grain: (1) a 3-inch pipe connection at the belt loader; (2) a 3-inch pipe at the elevator boot; (3) a 6-inch line to the garner bin; and (4) a 6-inch connection to the scale hopper.

The results of these tests can be summarized as follows:

(a) The shrinkage losses varied whether suction was used or not.

(b) On the whole, the shrinkage loss was slightly greater when the fans were not operating than when they were running.

(c) In two of the tests, when the fans were operating, the total shrinkage was 140 pounds for a total weight of 232,600 pounds, or about 1/16 of one per cent.

(d) In the other two tests when the fans were not operating, the loss was 180 pounds in a total weight of 232,-700 pounds—about 1/13 of one per cent.

(e) The largest shrinkage loss of 140 pounds occurred in one of the tests when the fans were not running.

(f) The results indicate that the effect on grain weights when suction is applied is practically the same as in the normal handling of grain without dust collecting equipment.

(2) Preliminary investigations have also been conducted by the Bureau of Chemistry in a number of grain elevators to determine the quantity of dust collected while elevating carlots of grain. The results of these tests can be summarized as follows:

(a) Tests on 39 cars showed an average of 7½ pounds of dust collected per car. Several cars in this lot contained very dusty oats and several others contained screenings.

(b) An average of 19 pounds of dust per car was removed from four cars of No. 3 white oats.

(c) In spite of the fact that these tests were made with 1918 equipment which was not so designed that at all fan speed it would be impossible to lift heavy particles from the moving grain stream, the quantity of dust gathered by the dust collecting sys-

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tem probably would not exceed the natural loss incurred without dust collecting equipment.

(3) Tests conducted by the Minnesota Railroad and Warehouse Commission in an elevator equipped with a dust collecting system designed and installed so that only the light floating dust was removed, showed the following results:

(a) During the unloading of a car containing 50,000 pounds of flax screenings, 13½ pounds of dirt, refuse and fibrous material was collected—1/33 of one per cent.

(b) In the unloading of another car containing 50,000 pounds of No. 2 northern wheat only 25½ ounces of dust was collected—1/300 of one per cent.

These two tests were conducted on the extreme grades of material handled in a terminal grain elevator.

(4) During the last year a large industrial plant in the Middle West handled approximately 1,791,250 bushels of corn with a moisture content of 16.49 per cent. There were 1,250 bushels of screenings removed—56 pounds per bushel equals 70,000 pounds. This amounts to only 7/100 of one per cent in weight.

Control of Floating Dust in Terminal Grain Elevators

IN 1923 and 1924 Underwriters' Laboratories, Inc., conducted investigations to determine the essential factors involved in the application of suction to belt loaders, belt discharge pulleys, elevator heads, garners and similar parts of grain-handling equipment in order to minimize the escape of floating dust into the atmosphere of the elevator and at the same time accomplish this object without picking up an appreciable quantity of solid grain.

In these investigations the following problems were studied at a number of terminal elevators in Minneapolis:

(1) What *maximum* air velocity should be allowed at dust hoods to properly care for the dust without drawing in solid grain?

(2) What *minimum* air velocity in branch pipes and trunk lines will carry the dusty air and refuse from floor sweeps without allowing any particles to settle out and clog the lines?

(3 The feasibility of locating inspection traps in pipe lines near suction hoods, to be used by inspectors when checking the performance of the system, enabling them to determine whether grain is removed through the dust system.

(4) Application of direct versus indirect suction. By "direct connection" is meant a hood tightly attached to a boot, a garner, or other equipment, and to which the suction pipe is tightly attached. "Indirect connections" usually have the hood near, but not connected directly to the enclosed equipment.

Results of the Investigations

THE findings of this investigation can be summarized as follows:

(1) To prevent the pick-up of solid grain, the average air velocity at the intakes of suction hoods should be limited to 500 feet per minute.

(2) The average air velocity in suction pipe lines should be at least 3,600 feet per minute to prevent the clogging of the lines by the settling of materials likely to enter the system. This is especially important in view of the frequent connection of floor sweeps and dust hoods to the same trunk line piping.

(3) A definite ratio exists between hood-intake velocity and pipe line velocity. In the usual type of installation this relation is expressed as a ratio of hood intake area to pipe area. Any pipe line velocity in excess of 3,600 feet per minute may be employed, provided the hood area is large enough to limit the intake velocity to 500 feet per minute.

(4) As compared with direct connections, indirect connections are not effective in removing or controlling floating dust.

(5) Inspection traps may be installed in branch pipe lines at convenient locations permitting determination by inspection that solid grain is not being carried away by the dust removal system.

Conclusions

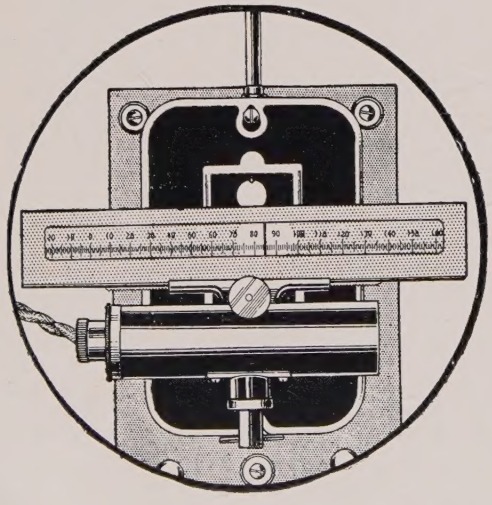
THE following conclusions can be arrived at as the result of these investigations:

(1) Effective systems can be designed for dust control in grain elevators without affecting grain weights.

(2) These systems should be under supervision of competent inspection authorities.

(3) Further research will be instrumental in working out the essential engineering features of the problem.

It will be necessary to develop and install effective methods for dust control and collection in grain elevators to reduce dust explosion losses. Until this is done, it will not be possible to make progress in dust explosion control in terminal grain elevators comparable to what has been accomplished in the control of dust explosions in other grain milling industries.



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"Glad to have an opportunity of entertaining our neighbors from 'South of the Border.'"

"The members may be assured of a most hearty Canadian welcome."

"When they come to Toronto, they will be made to feel as honored guests."

These are a few of the assurances that continue to pour into the office of the secretary of the Society of Grain Elevator Superintendents regarding the 11th Annual Convention slated this year for Toronto, April 1st, 2nd and 3rd.

There is absolutely no difficulty at the border. The Canadian government has instructed its agents to continue to see that every facility and courtesy is extended to Americans coming into and leaving Canada as in the past. Business conditions in the country are even better than usual. People are going about their daily work with confidence and assurance.

Hotels are operating exactly the same as usual and there is no difference whatever in the services available. Plans for the entertainment of the guests are being rapidly completed, and sessions packed full of timely and instructive business discussions and suggestions are assured.

★

SOY BEANS MOVE SLOWLY DURING THE MONTH

ALTHOUGH farm stocks and stocks in country elevators are large, a drop in price to the lowest point since last fall kept soy beans from moving during the past month. Receipts were small and farmers showed no disposition to sell.

Illinois, raising nearly half of the soy bean crop of the country, is estimated to have nearly 15 million bushels back on farms. Of this it is estimated that some 8 million bushels will move commercially at some time. In addition, there is a total of 2½ million bushels estimated to be in country elevators. Farmers are banking on the expectation that there will be a big increase in the acreage planted this year, and therefore a resulting demand for seed beans.

Visible supplies of beans have been decreasing during the month. Baltimore cleared two cargoes and arrivals at Gulf ports have been of fair volume. The Department of Agriculture states that because of war conditions, the exports of Manchurian beans will be smaller than usual.

BACK AT HOME



ARVID ANDERSON, Crowell Elevator Company, Omaha, is home from the hospital where he underwent an operation. He is progressing nicely and will shortly be back on the job.

★

NOXON GOES SOUTH

MALCOLM NOXON, Superintendent of the Purina Elevator in Minneapolis, is spending a month on vacation in the sunny South.

★

TWO TICKETS TO TORONTO?

ROUND-TRIP rates for the 11th Annual Convention of the SOGES in Toronto have been announced by the Canadian Pacific Railway from various points in the United States. A party rate for a group of 25 or more traveling together in a coach will provide the most economical form of transportation. On the return journey it would not be necessary for the members of the party to travel together, but the 16 day ticket could not be raised from coach to pullman on the return. From Chicago, for example, the fare would be $15.35.

Regular round-trip rates from different cities are:

	Pullman	Coach
Kansas City	$50.60	$39.20
Omaha, Neb. ...	42.35	40.60
Minneapolis	48.25	47.35
Chicago	29.90	22.65
St. Louis	40.25	33.40
Detroit	13.95	12.05

The charge for an upper berth from Chicago is $2.70, a lower $3.95. A compartment for one person is $7.90 and for two, $11.05. The best hour for departure from Chicago is 8 P. M., arriving in Toronto at 8:30 A. M.

TRIP TO DECATUR, INDIANA

THE Chicago area boys are making a trip to the Decatur, INDIANA, plant of the Central Soya Company on Saturday, February 10th—a much looked forward to inspection tour.

A special coach will be added to the Pennsylvania R. R.'s 9:30 a. m. train from the Union Station and, in addition to the scheduled stop at Englewood at 9:45, a special stop will be made at the South Chicago station at 9341 Commercial Avenue, at 9:50, for the South Chicago boys. Gary is also a stop.

Special rail rates of $4.45 to Fort Wayne and return will be available, provided a group of 25 or more make advance reservations with trip chairman Barney Weller. The regular rate is $6.60. A special bus will take the party from Fort Wayne to Decatur, a short distance south.

Returning, the group will ride the fastest train in the world, the Detroit Arrow, leaving Fort Wayne on their special coach at 6 p. m. and arriving Chicago at 8:10. About 40 are expected to participate.

★

Chicagoans Dance

THE success of the dinner-dance affairs of the Minneapolis and Kansas City Chapters of the Supers' Society led the Chicago Chapter to try their hand—and did they succeed. President Alger, Vice President Gil Lane and Secretary Sandy Keir really put on a show, with 20 entertainers from the Fenger High School keeping the boys (and their respective "war departments") applauding no end. Seventy-three participated and declared the affair an outstanding success.

★

FRIED CHICKEN AT KANSAS CITY

SCOTT S. BATEMEN, Warehouse Commissioner of Kansas, was the principal speaker at the January 16th meeting of the Kansas City Chapter of SOGES. 31 members were present to hear Mr. Bateman point out the uses and benefits of warehouse receipts. A fried chicken dinner was served. Claude Darbe, Secretary of the Chapter, has promised to have a prominent speaker at each of the next meetings.

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